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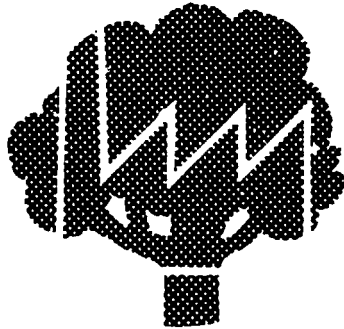
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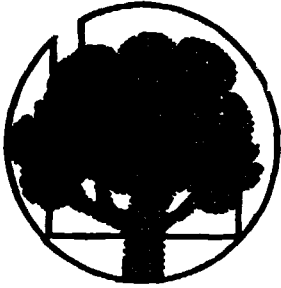
FOREWORD

There is a growing recognition of the fact that industrial progress, like economic progress in general, is inseparably linked to a healthy environment. Nations should ensure the environmental sustainability of development, maximizing long-term beneficial impacts on the quality of life by minimizing adverse environmental effects. Reconciling industrial progress with the need to safeguard the environment also represents a major challenge to the international community: as some of the major environmental issues are of a global nature, co-operation is essential to tackle them.

The United Nations Conference on Environment and Development (UNCED) represents an important step forward in tackling global environmental issues, examining, inter alia, relationships between environmental degradation and industrial activities to ensure better integration of development and environmental issues.

In the eyes of UNIDO, environmentally sustainable industrial development (ESID), based on cleaner technologies, could become one of the major instruments for attaining a symbiosis between development needs and a healthy environment. As with all other aspects of development and the environment, international co-operation will be needed to ensure global agreement on basic issues and to make available the required know-how, technologies and finance to the developing countries.

The present brochure aims at presenting, in brief, UNIDO's views on key issues related to industrial development and the environment as well as on actions required to strengthen the contribution of industry to a healthy environment. It is hoped that in the UNCED negotiation process this brief exposé will be of assistance to developing countries in identifying these key issues as well as the actions required to strengthen industry's contribution.



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I. MANUFACTURING, DEVELOPMENT AND THE ENVIRONMENT

A. Some basic issues

Safeguarding the natural environment is one of the major challenges faced by humanity at the threshold of the twenty-first century. At the same time, the need to improve living standards in the developing countries has lost none of its urgency. All measures taken to find a balance between economic development and the need to preserve natural foundations will have to acknowledge the crucial role of manufacturing. Its massive contribution to improving material living standards cannot be separated from its effects on nature.

In the improvement of material living standards and knowledge levels, the manufacturing sector has been and remains a key factor. Housing, feeding and transporting people, education, research and medical services are all dependent on industrial products. Worldwide, manufacturing also provides much of the employment which allows people to enjoy higher levels of material welfare. But the massive and increasing production of manufactured commodities is based on finite natural resources, and the continuous search for new products has led to the introduction of an increasing number of hazardous, non-degradable man-made substances. In the past, markets either ignored or underestimated the cost of pollution and of natural resource depletion. This uneconomical approach to nature has encouraged a pattern of industrial growth now recognized to be unsustainable. Long-term development, for which manufacturing is indispensable, must in the future be built on the concept of environmental sustainability.

Manufacturing and the environment are linked in several ways:

- (a) Through raw material exploitation;
- (b) At the processing stage;
- (c) Through products used as inputs in other productive activities;

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(d) Through the consumption and disposal of final products; ⁴

The impact of auxiliary activities for the production and distribution of manufactured goods such as transport and energy generation (which are again based on industrial products and/or processes) should also be taken into account. Because of the manifold, strong linkages between manufacturing and the environment, the sector has a key role to play in preventing a further deterioration of the environment; conversely, most measures to protect the environment will have direct or indirect effects on industrial development.

Production and consumption patterns of industrial products differ among countries and population groups, and their environmental impact is therefore differentiated. As pointed out in a note by the Director General of UNIDO for the 1991

Examples of environmental problems to which the consumption and production of manufactured goods contribute and where UNIDO has carried out measures to protect the environment include, inter alia

Depletion of natural resources:

Viet Nam Reduction of forest timber wastage, improved utilization of forest residues

Trinidad and Tobago Advisory assistance on the industrial application of microbiological enhancement of oil recovery

Pollution

Brazil Assistance in the operation of a joint tannery effluent treatment plant

Hungary Development of non-toxic anti-insect agents

Climate change

Africa Region Regional programme for the establishment of small hydro power plants

Asia and Pacific Region Regional network on control and regulatory measures concerning motor vehicle emissions

(See UNIDO/UNEP's Environment and Energy-related Projects, June 1991)



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General Conference²⁴, "the continuing deterioration of the global environment is closely related to the unsustainable pattern of production and consumption in particular in industrialized countries".

The Preparatory Committee of the United Nations Conference on Environment and Development has remarked that "current lifestyles and consumption patterns of the affluent middle class of some developed countries ...are not sustainable"²⁵. At the industrial sub-sector level, patterns differ as well, traditional heavy industry being among those with the heaviest environmental impact.

The effects of environmental deterioration are also differentiated. While atmospheric change affects everybody, the more localized forms of environmental degradation now seem more common in developing countries (where, among others, effluent control and waste disposal methods are often deficient) and particularly affect the urban poor, who are reduced to living and working in a heavily polluted environment. Within this category, women and children are particularly at risk. Finally, ecosystems react differently to damage, and impacts may vary even locally. Measures taken to improve the environment or to prevent its further deterioration should in short be problem-specific; at the same time, they should take account of the possible interlocking of problems.

B. The involvement of the developing countries

While the unsustainable pattern of production and consumption in industrialized countries has been identified as the basic environmental problem at the global scale, sheer poverty may make a stronger impact on the local or national environment in developing countries, with inevitable "spread effects" on the global environment. The relative impact of poverty would be strongest in least developed countries, with their low levels of per capita income and industrial development. Individually, survival-oriented activities of the poor (such as cottage industries) may not have a major impact on the en-

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vironment, as the demands on resources are very modest; but the combination of population pressure and unequal access to productive resources⁴² forces an increasing number of people to overexploit marginally productive, fragile ecosystems.

For developing countries, industrialization offers a way out of poverty, but a lack of financial resources, know-how, standards and information, inadequate environmental legislation and administrative capacity, as well as a general lack of environmental awareness, often lead to widespread use of environmentally unsound production processes that waste raw materials and energy and unnecessarily cause pollution. Because of lower overall production and consumption levels, the cumulative effect on the environment may still be modest as compared to that in the industrialized countries. However, manufacturing in some of the more advanced developing countries is growing faster than the world average, and there is a global tendency for heavily polluting and/or highly resource/energy intensive industries to be relocated in developing countries. Some technology-intensive growth industries such as electronics also present environmental hazards. In such cases the need for a coherent set of environmental policies and measures is particularly urgent.⁵²

There are important links between the production and consumption patterns of industrialized countries and those in developing countries. First, there is a tendency to imitate the industrialized countries.⁶⁷ Trade is the second link. Most raw material exports of developing countries are intended for developed country industries, and much of their industrial output is meant for developed country consumers.⁷¹

On a per capita basis, the Organization for Economic Co-operation and Development (OECD) countries consumed nearly 10 times more energy in all its forms than developing countries in 1985. However, the industrial energy consumption per million US dollars of real industrial value added was twice as high in the developing countries as in the OECD countries.

(UNIDO, Industry and Development Global Report 1991/92, p. 93, 95).



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A variety of factors complicates the trade and environment issue. A country may be forced to improve its trade balance, to increase commodity production beyond sustainable levels. Inappropriate export incentives may encourage environmentally unsound production methods.

Exports of goods from developing countries may face obstacles because of stricter environmental standards in developed countries. The main condition for trade that serves sustainable development would be that end-user prices should reflect the real costs of measures necessary to protect the environment in the countries of origin as well as in the country of destination or transit.⁸⁷

These brief remarks indicate the extent to which the environment and trade are intertwined; measures to safeguard the environment could therefore have a strong impact on trade in industrial raw materials and manufactured products. Sustainable development would require an increase in trade shares of goods with a minimal environmental impact. Such changes would affect developing countries to a greater or lesser degree, depending on the role of trade in the economy, the range and type of commodities traded etc.

To recapitulate: the manufacturing sector is the key to improving material standards of living. This has been interpreted by many to mean unlimited growth on the basis of an underpriced input--nature. Through trade and imitation of the industrialized countries, the developing countries are involved in industrial development patterns which are now faced with the problem of finite natural resources and a breakdown of basic ecological processes. Being the greatest producers and consumers, the industrialized countries should lead the way in adopting "...patterns of industrialization that enhance economic and social benefits...without impairing basic ecological processes".⁸⁸ However, given the vast unmet demand in developing countries, and the rapid industrial growth rates of the more advanced developing countries, such patterns will have to be adopted globally to halt the further deterioration of the

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environment. Which changes are needed in manufacturing to meet the challenge of sustainable development?

II. ECOLOGICALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT

A. Concept and criteria

Safeguarding the environment implies, among others, that industrial processes should leave essential ecosystems, and the relations between these, intact. UNIDO has suggested the following definition of ecologically sustainable industrial development (ESID):

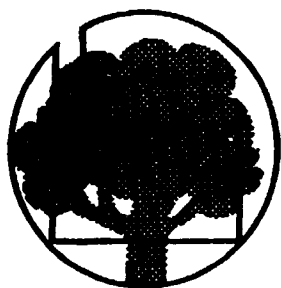
“... those patterns of industrialization that enhance economic and social benefits for present and future generations without impairing basic ecological processes...significant degradation of ecological processes by industrialization, as well as by other human activities, is ipso facto unsustainable over long periods.”¹⁰²

UNIDO suggests three criteria for ESID:¹⁰³

- (a) It must protect the biosphere;
- (b) It must make the most efficient use of man-made and natural capital;
- (c) It must promote equity.

Basic criterion (a) is very difficult to fulfill because it requires a variety of interlinked measures and a high degree of international agreement and co-ordination. It includes reducing the threat from greenhouse gases and ozone-depleting substances, maintaining the carrying capacity of natural resource systems and protecting the absorptive capacity of air, water and soil from emissions and waste discharges.

The main strategies for protecting the biosphere are the achievement of ambient standards for individual pollutants and the stabilization and (eventual) reduction of total loadings of pollutants. While more costly, the reduction of total loadings



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is essential for preserving overall ecological balances. This implies the massive substitution of renewable energy for fossil fuels along with vast improvements in energy efficiency, and the near-closing of the materials and product cycles (a complete closing of the cycles would not be possible because of inevitable decay). The energy issue is a particularly important one, because of its direct relationship with key environmental problems like global warming. The execution of the two strategies implies a minimization of raw material and energy inputs—the production process must, in other words, be as efficient as possible (criterion b).

With regard to the issue of equity (criterion c), if the present production and consumption patterns of the richest countries and population groups are the main cause of environmental deterioration (see Chapter I, section A), then it follows that these must accept the largest responsibility for the reorientation of global economic development towards long-term ecological sustainability: "...eliminating global damage must be...in relation to the damage caused"¹². Given the fact that environmental problems are now of a global nature and that countries are economically interlocked, it is moreover in the self-interest of the developed countries to assist the developing countries in promoting sustainable manufacturing.

There are several other aspects to the equity issue. At the national level, programmes for the poor combining better access to productive resources with the promotion of sustainable activities would reduce the need of the poor to exploit marginal, fragile natural resources. Such programmes would have to take special account of women, whose access to the required know-how and resources often faces special obstacles. And strong, effective long-term measures to halt a further deterioration of the environment should be taken now to prevent an exponential growth in the cost which future generations must pay for environmental damage.¹³

B. The cradle-to-grave approach

So far, the approach to reducing environmental damage has been one in which "end-of-pipe" technologies (treating

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emissions after the production process) dominate. The new approach that is emerging as a result of more stringent environmental requirements (total loading standards) is based on the prevention of damage—applying production processes that are cleaner, using less energy and creating cleaner products. This is a more effective and in many cases ultimately cheaper way of reducing total pollutant loadings. With biosphere protection and efficiency criteria in mind, this approach can and should be expanded to include a reduction of raw material requirements through recycling, reducing the raw material content of products and increasing their technical and economic life.

This all-in approach is known as the “cradle-to-grave” approach; it might also be called a “planning-to-reuse” approach. Fully developed, such an approach would greatly reduce the environmental load at the level of individual products. If these efforts lead to a near closing of product and materials cycles, the cumulative effect of manufacturing activi-

Some examples of the savings that can be achieved through cleaner production

Tanzania: Rehabilitation of the electrostatic precipitators in a cement factory is reported to produce a significant reduction of air pollution and to result in cost savings of about \$US 8,000 per day.

Brazil: A steel mill introduced cleaner production with an improved rolling mill, water/gas treatment and charcoal handling systems. This reportedly led to savings of \$US 1.5 million per year and a reduction in tree cutting of 1000 ha per year.

India: It has been calculated that an investment of Rs 36 billion in industrial energy conservation would be required to realize an energy conservation of 35 per cent throughout the industrial sector, whereas an estimated total investment of Rs 59.25 billion would be needed to generate that amount of energy.

UNIDO, *Industry Initiatives in Achieving Ecologically Sustainable Industrial Development*, p. 15.

UNIDO, *Industry and Development Global Report 1991/92*, p. 96.



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ties and products on the environment (total pollution loadings, raw material depletion) is minimized. A crucial part of this all-in approach will be to internalize the cost of using natural resources as a source of raw materials or an assimilator of effluents. While such costing has its limits in safeguarding the biosphere¹⁴ its adoption is essential - traditional systems of accounting (whether at the national or at the enterprise level) do not take account of environmental damage resulting from economic activities. At the national policy level, the role of policies, financial instruments and regulations must be analysed for their impact, and where necessary these should be revised to provide a supporting framework for ESID.

Most progress in the cradle-to-grave approach seems to have been made so far in reducing raw material contents and in cleaner production. Increasing the economic and technical life of products, however, would have to be reconciled with the trends towards continuous innovation and rapidly changing fashions in developed economies. Progress in this area will heavily depend on changing lifestyles and on a re-thinking of development priorities in the research and business community. An important step forward in connexion with the latter is the Business Charter for Sustainable Development, formulated by the International Chamber of Commerce and adopted by a number of transnational corporations (TNCs).¹⁵

The various aspects of ESID--the cradle-to-grave approach, the interdependence of countries, equity issues, the linkages between manufacturing and other economic activities (notably transport, power generation and raw material production), pricing, policies and economic instruments--indicate that action for ESID involves a wide spectrum of measures. The measures that are being taken and that should be taken to promote ESID are discussed below.

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III. MEASURES FOR ACHIEVING ESID¹⁹:

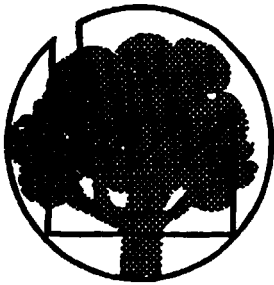
A. The role of Governments

Government action is essential for progress towards ESID. The complex, interrelated problems which must be solved in this context require an approach that will often be beyond the interest of individual economic actors. Moreover, the long-term interests of all groups in society must be balanced.

As a basic principle, Governments should consider environmental concerns to be an integral part of economic policy-making, and of industrial policy in particular. With this principle in mind, the environmental impact of current and planned policies should be reviewed, taking account of the following:

- (a) Present and expected industrial development patterns and the role of manufacturing in overall development;
- (b) The present and expected impact of industrial development on:
 - (i) *Non-renewable resources;*
 - (ii) *Renewable raw material exploitation;*
 - (iii) *Energy, water and transport requirements;*
 - (iv) *Pollution levels (caused by production processes, products and their final disposal);*
 - (v) *Relations between various ecosystems, or elements of these;*
- (c) Import and export patterns;
- (d) The role of regulatory and economic instruments;
- (e) Employment and skill patterns and requirements.

Where applicable, such a review should be region-, population group-, gender- and branch-specific in order to



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pinpoint present and likely future problems and to ensure that future policies and measures are effective.

After completion such a review, a framework for ESID can be set up. Such a framework may well be based on existing industrial strategies, provided that ESID considerations can be built in. Where ESID is likely to affect other economic sectors (in particular the primary sector, energy and water, trade and transport), the consequences should be spelled out. The ESID strategy would indicate whether re-orientations of industrial production may be needed or are expected, especially in regions with a fragile natural environment. Special consideration would be given to industries needing rehabilitation and/or restructuring, as these "end-of-cycle" industries tend to waste energy, raw materials and water; rehabilitation and restructuring moreover offer good opportunities for introducing environmentally sound production methods.

In formulating an ESID strategy, developing countries might benefit from focussing on the best available techniques and technologies, processes and standards, adapted to their specific situation where needed. While a relatively low level of environmental damage may seem to offer some latitude for environmentally sub-optimal industries, a continued reliance on these offers a precedent for additional activities that are unsustainable. Moreover, such unspoiled natural resources as remain may well be essential for retaining local or global ecological balances. The overall environmental cost of sub-optimal production is therefore higher in the longer run. Support from industrialized countries (see below) would help developing countries to adopt the best instruments available.

After the formulation of an overall strategy, specific measures to create a supporting framework for ESID would be formulated. These measures, the cost of which should be seen as an investment in development which is sustainable in the long term, would include:

- (a) Introducing the "polluter/user pays" principle in

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economic policies, including the internalization of externalities in price calculations. To realize the latter on a sector-wide scale, Governments should promote the design and/or adoption of suitable auditing methods;

(b) Adapting the existing body of regulations and incentives and introducing, where appropriate, new instruments (e.g. charges, taxes, tradeable pollution permits), ensuring that a balanced mix of effective instruments is created to encourage ESID;

(c) Establishing new or strengthen existing procedures for reviewing industrial projects with potentially significant environmental effects. Such procedures should also be applied to products. Assessment methods would be based on the cradle-to-grave method and, wherever possible, on internationally recognized guidelines;

(d) Creating an adequate institutional framework for the implementation of environmental policies, including a strong and centrally placed environmental ministry or agency;

(e) Encouraging ESID-related R+D and technology transfer as well as more efficient use of existing technologies and procedures;

(f) Providing access, on preferential conditions, to finance for small- and medium-scale enterprises to encourage ESID-oriented restructuring and modernization, taking special account of female entrepreneurs;

(g) Promoting the diffusion of sustainable manufacturing activities in rural areas to improve rural living standards and slow down urban migration, thus reducing poverty-related environmental problems;

(h) Promoting training of managers, engineers and employees in the field of ESID, including female entrepreneurs and factory staff, to ensure their full contribution;

(i) Improving public awareness and promoting ESID through environmental education, and encouraging the in-



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volvement of the public in general and of non-governmental organizations (NGOs) such as industry federations, trade unions, consumer organizations and environmental organizations in ESID-related issues. Again, special attention should be given to increasing the awareness of women, because of their generally lower educational standards and their key role in informal knowledge transfer to children;

- (j) Strengthening national health policies with regard to pollution-related issues, giving special attention to groups likely to suffer most from environmental hazards—the urban poor, children, the old, women of child-bearing age—and ensuring better occupational health and safety standards, especially for workers in high-risk industries.
- (k) Promoting the exchange of information on ESID and the transfer of the relevant know-how and technology to other countries, and to the developing countries in particular;
- (l) Ensuring that ESID is a long-term policy issue. Specific country characteristics will lead to very different outcomes with regard to strategies with regard to ESID. Apart from countries with a rapidly growing manufacturing sector (see Chapter I, section B) special challenges would be faced by:
 - (a) Countries with particularly fragile environments (e.g. small island States, mountainous countries, Sahel countries);
 - (b) Countries heavily relying on fossilized energy and other non-renewable raw material exports;
 - (c) Countries with very high population densities;
 - (d) Countries whose environment has already been strongly affected (e.g. those with large heavy industry sectors or extensive deforestation).

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B. The role of industry

Entrepreneurship is based on individual responsibility and selfreliance, and long-term thinking is essential for successful industries. These characteristics ensure that manufacturing enterprises can play an independent, leading role in promoting ESID. Cleaner production is the ESID objective where industry can make the most immediate impact. As the examples in Chapter II, section B show, there is increasing proof that cleaner production can lead to major savings through more efficient raw material and energy use, through re-use and recycling.^{17/} Moreover, the growing market for "green" products--pollution-prevention and energy-saving equipment, recyclable consumer goods etc.--allows direct profits to be made. Stricter legislation in many countries, moreover, now penalizes pollution. The introduction of environmental cost accounting will strengthen this trend.

Cleaning up production processes of old production facilities is often costly, though "good housekeeping" can sometimes lead to significant improvements in e.g. pollution reduction and energy saving at little cost. The greatest progress however is more likely to be made by new facilities based on new equipment, production processes and products which minimize environmental impacts from the start. The low level of industrial development in many developing countries could be an advantage in this respect, as "leapfrogging" to the newest, cleanest, ultimately more cost-efficient technologies, may be possible.

Industry-level measures needed for ESID include:

(a) Using, where feasible, raw materials, product formulations, production processes and energy sources that minimize the impact on the environment; recycling products and waste materials. This would also imply:

- (i) Assuming a cradle-to-grave approach to industrial products and in the assessment of new projects;
- (ii) Preventing pollution at the source;
- (iii) Increasing the technical and economic life of products;



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(b) Increasing R + D activities which emphasize cleaner production and environmentally friendly products;

(c) Exploiting markets for "green" products;

(d) Integrating environmental awareness and responsibility at both management and employee level, introducing environmental accounting procedures, providing training and information for staff, taking special care to ensure that any obstacles to a full contribution on environmental issues by female staff are removed;

(e) Providing a healthy working environment;

(f) Exchanging and disseminating information on environmentally sound production to other enterprises and to the public at large.

Most of the know-how with regard to cleaner production is held by manufacturing companies in developed countries. In order to ensure an improvement of environmental standards, or the prevention of environmentally hazardous operations, in enterprises in developing countries, it is of crucial importance to transfer the available relevant know-how about technologies, products, processes, management aspects and training procedures to these countries. The 1991 Second World Industry Conference on Environmental Management (WICEM II), organized by the International Chamber of Commerce, proposed the establishment of an International Clearing House for Technology Access. This would be a joint effort of industrial enterprises and United Nations Environment Programme (UNEP) with the purpose of disseminating information on cleaner technologies.^{18/}

TNCs could play a key role in promoting clean production (and ESID in general) in developing countries. WICEM, the United Nations Center for Transnational Corporations (UNCTC) and ESID documentation (references) indicate that TNCs are setting environmental standards for their own operations; they are well-placed to stimulate the diffusion of environmentally sound practices in the developing countries

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where they operate. TNCs often have a key position in the manufacturing sector in these countries; this should ensure a strong impact of their efforts in this respect.

Small and medium-scale industries represent a major factor in the development of the manufacturing sector in developing countries; as indicated above, however, such local industries often do not have the know-how and access to finance and information required to reduce pollution, to increase the efficiency of energy use and raw materials etc. This is particularly true for the smaller enterprises and for those owned by women. The majority of these enterprises is found in the food processing and textiles sub-sectors. Entrepreneurs in such industries would need external assistance focussed on their particular problems.

Another special category is constituted by heavy industries, such as petrochemicals, which are the core of the industrial development process in some of the more advanced developing countries. These industries are often particularly heavy polluters. While assistance to small and medium-scale industries would probably be more a task for Governments, international organizations and NGOs, assistance to heavy industries could benefit strongly from the expertise of major developed country companies, including TNCs.

While individual enterprises would be directly involved in the transfer of clean production technologies, industry associations have a key role to play as well, using their network of contacts to promote cleaner production. Examples include the International Clearing House for Technology Access referred to above, the Business Council for Sustainable Development, and the International Network for Environmental Management created by the German Environmental Management Organization BAUM. On the employee side, trade unions have a strong role to play in cleaner production, as an extension of their actions for health and safety in the working environment. An additional reason for trade union support to clean production, and ESID in general, is that the loss of employment in heavily polluting industries could well be compensated by a net overall employment gain in "green" activities. These are a



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growth factor, and even where ESID activities are not labour-intensive, there are likely to be multiplier effects on employment in related activities as well as in the overall economy.

The impact on the environment as well as the scope for cleaner production varies among industries. UNIDO studies of the alumina, leather, phosphate fertilizers, plastics and plastic waste recycling, and pulp and paper industries ¹²⁴ indicate that most of the progress with regard to ESID has been made in the use of and/or search for pollution-control technologies. There is also a growing understanding that industry has a responsibility for ensuring that end products do not damage the environment. Recycling is getting increasing attention, but it is not always economical. This problem can partly be solved by reducing the production of disposable goods (e.g. packaging), but this issue is not strongly addressed yet. Safeguarding the natural resource base gets some attention, but the related issue of biodiversity is not yet resolved.

Even though these case studies make it clear that problems (and therefore remedial measures) are often industry-specific, a cradle-to-grave approach, being an integrated way of looking at environmental issues throughout the production/consumption cycle, would have to be adopted in all future planning, as it is the only approach which will take full account of the environmental consequences of individual manufacturing activities. Where irreversible damage is done to basic ecological processes, activities or products should be phased out. A first example of this is the phasing out of processes and products causing the destruction of the ozone layer. An approach based on pollution prevention implies that industrial planning should move away from such activities altogether.

C. Community participation

The need to involve those who do not directly participate in industrial production and planning has been noted in the previous section. As all citizens are affected by, and can

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influence, environmental deterioration, it is necessary to ensure community participation in action towards ESID.

Historically, civic action groups have played a pioneering role in the debate on the environment, especially in the developed countries, and they continue to play a key role in this debate. This is due to the fact that they have no vested interests in activities that are linked to environmental hazards and can therefore focus directly on such hazards.

For community participation to be effective, close co-operation with enterprise and Governments is essential. Entrepreneurs will have to make ESID work, and Governments must create conditions for ESID. The role of NGOs and civic action groups is very much a "watch-dog" role. If these groups are to make a constructive contribution, it is essential that Governments and industry provide the necessary information, establish efficient communication channels and encourage citizen participation in the debate on environmental issues.

D. International co-operation

International co-operation is essential because of the global nature of environmental problems, the need to transfer know-how and technologies on ESID from the developed countries to the developing countries and the limited financial resources available in the latter to initiate the process towards ESID. Partners in this process include the organizations of the United Nations system, regional and sub-regional organizations, individual countries and NGOs. While much depends on North-South co-operation, co-operation among the developing countries is crucially important as well, mobilizing their own expertise, capacities for the design of cleaner techniques and technologies etc., and ensuring that their vital interests are fully taken into account.



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International co-operation for ESID would include the following areas:^{20/}

- (a) The establishment of strategy and policy frameworks for industrial development based on environmental considerations through:
- (i) The assessments of the environmental impact of present industrial activities and development strategies;
 - (ii) The identification of the potential and priorities for environmentally sound sectoral and subsectoral activities, particularly those where developing countries have a competitive advantage;
 - (iii) The creation of the required institutional infrastructure;
 - (iv) The adaptation/introduction of regulations and incentives, including standards to be applied internationally;
- (b) Assistance to developing countries in identifying financial resources, private or public, where possible on concessional terms, that would enable them to acquire the technologies and the technical, managerial and administrative know-how required to achieve ESID; such assistance would be performance-related to ensure rapid progress towards ESID and would be reserved for those cases where an increase in efficiency with available means does not guarantee sufficient progress;
- (c) The introduction of cleaner production processes and strengthening of the domestic technical and scientific capacity for such processes. This would include the following areas:
- (i) Assessing the financial, economic and environmental benefits of ESID and the development of techniques for identifying and measuring environmental impacts;

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- (ii) The design, establishment, operation, evaluation and monitoring of pollution prevention techniques and cleaner technologies, production processes and products;
- (iii) An ESID-approach to the rehabilitation of existing industries;
- (iv) The preparation of guidelines on environmentally sound industrial practice for selected sectors;
- (iv) The transfer of technology and managerial know-how, e.g. through the establishment of demonstration centres for ESID, and the creation of endogenous R+D capacity. To ensure a full contribution to ESID by women, particular attention should be paid to their representation in such activities;
- (v) Education, training and dissemination of relevant information, again with particular attention to women.

The participants in international co-operation constitute a wide spectrum: Governments and private enterprise in

Technical assistance by UNIDO to promote cleaner production in developing countries covers a number of areas indicated above. Examples include:

The establishment of a demonstration plant for black liquor desilication at a newsprint enterprise in Nagar, Kerala, India

A rehabilitation programme for an aluminium casting plant in Pleven, Bulgaria, which would reduce environmental pollution

Optimizing the environmental performance of metal steel works in Argentina and Thailand through improved management and training

The preparation of an Audit and Reduction Manual for Industrial Emissions and Wastes

The assessment of the of the feasibility of an industrial-scale pilot biogas plant in Harare, Zimbabwe



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industrialized and developing countries, international organizations and NGOs. A division of labour among these is necessary to make the most of each actor's special abilities, depending on the specific issue(s) addressed. Co-ordination, however, is essential, given the fact that the various aspects of ESID are interrelated. Actors should, individually and collectively, review the environmental impact of existing programmes, incorporate environmental concerns in their future work and co-operate on international environmental conventions. The mutuality of interests between developed and developing countries in achieving ESID provides a compelling argument for stronger North-South and South-South co-operation.

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NOTES

1) UNIDO, *Industry and Development - Global Report 1990/91*. (UNIDO publication Sales No. E.90.III.E.12) p. 93.

2) UNIDO, "UNIDO Environment Programme - Report of the Conference on Ecologically Sustainable Industrial Development, Note by the Director General" (GC.4/25/Add.1), p. 6.

3) United Nations, UNCED, "Cross-sectoral issues - the relationship between demographic trends, economic growth, unsustainable consumption patterns and environmental degradation" (A/CONF.151/PC/46), p. 14.

4) See, e.g., United Nations, UNCED, "Poverty and environmental degradation" (A/CONF.151/PC/45).

5) See, e.g., J.-O. Williams and U. Golueke, eds. *WICEM II, Second World Industry Conference on Environmental Management - Conference Report and Background Papers*. (Norway, International Chamber of Commerce, 1991), p. 134, 486.

6) See United Nations, UNCED, "Cross-sectoral issues" (A/CONF.151/PC/46), p. 9.

7) See, e.g., United Nations, UNCED, "The international economy and environment and development: Report of the Secretary General of the Conference (A/CONF.151/PC/47), p. 5; the tables "Origin of imports/destination of exports by branches" in the UNIDO data base provide numerous examples with regard to trade in manufactures.

8) United Nations, UNCED, "Environment and international trade" (A/CONF.151/PC/48), p. 13-14; see also UNIDO, "Barriers facing the achievement of ecologically sustainable industrial development" (ID/WG.516/1), p. 25-26.

9) UNIDO, "The road to ecologically sustainable industrial development" (ID/WG.516/7), p. 14.

10) *Ibid.*, p. 14-15.

11) *Ibid.*, p. 15.

12) United Nations, "Resolutions adopted on the reports of the Second Committee" (A/44/746/Add.7), p. 301.

13) United Nations, UNCED, "Poverty" (A/CONF.151/PC/45), p. 12; UNIDO, "The road" (ID/WG.516/7), p. 18.

14) Pricing cannot "repair" irreversible environmental damage that has already taken place. This point is made in UNESCO, *Environmentally Sustainable Economic Development: Building on Brundtland*, Robert Goodland, et al., eds. (Paris, 1991), p. 66.



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15) See J.-O. Willums and U. Golueke, eds., *op. cit.*, p. 19f.

16) Suggested measures are largely derived from UNIDO, "UNIDO environment programme" (GC 4/25/Add 1).

17) For more examples see UNIDO, *Industry and Development - Global Report 1990/91*, p. 148f and "Industry initiatives in achieving ecologically sustainable industrial development" (ID/WG 516/6), p. 15

18) See J.-O. Willums and U. Golueke, eds., *op. cit.*, p. 15.

19) See UNIDO, "Pulp and paper, case study No. 1" (ID/WG 516/4), "Alumina industry, case study No. 2" (ID/WG 516/8), "Leather industry, case study No. 3" (ID/WG 516/10), "Phosphate fertilizers, case study No. 4" (ID/WG 516/14), and "Plastics and plastic waste recycling, case study No. 5" (ID/WG 516/15).

20) See, e.g., UNIDO, "International cooperation for ecologically sustainable industrial development" (ID/WG 516/3), p. 33-34



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